

Amendment
U.S. Patent Application 10/672,269

REMARKS

Claims 1-8, 14, and 15 are pending in the subject application: claims 1-8, 14, and 15 stand rejected. New claim 16 has been added. In addition, Applicants have elected, without traverse, to withdraw claims 9-13. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

Applicants would like to extend thanks to the Examiner for conducting a telephone interview on September 8, 2005.

The Examiner objects to the disclosure due to informalities. Applicants have carefully reviewed the specification, and it is believed that each and every issue raised by the Examiner has been addressed by the above amendments to the specification. Specifically, Applicants have amended the drawings to address the issues raised by the Examiner. Corrected drawing sheets are attached with a label indicating "Replacement Sheet" pursuant to 37 CFR 1.121(d).

Claims 1-8, 14 and 15 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants have amended the claims to address each of the issues raised by the Examiner. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

The Examiner objects to the specification and rejects claims 1-4, 14 and 15 under 35 U.S.C. § 112, first paragraph, as failing to provide an enabling disclosure. Specifically in claims 4 and 5 the Examiner objects to the terms "mixture" and "non-halogen based gases". Applicants have amended the specification to include the term "non-halogen gas" and amended claim 4 to remove the reference to "mixture". In doing so, no new matter was added. In addition, the Examiner has objected to the term "large concentration", each of the relevant claims have been amended rendering the claims definite. As to claims 14, and 15, Applicants have amended the claims to address each of the issues raised by the Examiner.

Claims 1-8, 14 and 15 stand rejected under 35 U.S.C. § 102 (b) as being anticipated by U.S. Patent No. 6,054, 063 to Ohtake, U.S. Patent No. 6, 410, 450 to Kitagawa, and U.S. Patent No. 5, 983, 828 to Savas. The Examiner asserts that the apparatus of Ohtake, Kitagawa and

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Savas all have the inherent capability of the present invention as claimed in claims 1-8, 14 and 15. Specifically, the Examiner contends that “continuous in time” includes a short period of time thus including pulsed time. Applicants respectfully disagree.

Amended independent claim 1 recites a processing chamber, an electron source which produces an electron beam in response to the source being in an energized state, and a high energy electron beam confiner. The apparatus of Ohtake and Savas disclose an apparatus that employs a “pulsed” electron source. A pulsed electron source involves turning on and then subsequently turning off the source, repeatedly. This is in direct contrast to the present invention as claimed in amended claim 1 wherein the *source produces a continuous high energy electron beam in response to the source being in an energized state*. Applicants respectfully submit that it is well known in the art that a “continuous source” is mutually exclusive to a “pulsed source”. Furthermore, Applicants respectfully submit that Ohtake and Savas fail to teach or suggest any concept of a source that produces a continuous high energy electron beam as recited in amended independent claim 1.

U.S. Patent No. 6, 410, 450 to Kitagawa teaches an etching of a substrate wherein a magnetic field is applied to a plasma generating space and the plasma formed is diffused through the negative ion forming space (col. 3, lines 24-28). In addition, the Kitagawa device requires a second halogen gas to be injected into the chamber that has a temperature less than the first gas. This is in direct contrast to amended independent claim 1 wherein *a high energy electron beam confiner confines beam and the confined beam ionizes the halogen gas creating plasma*. Accordingly, amended independent claim 1 does not employ diffusion or a plasma generating space for the diffusion. Furthermore, Kitagawa teaches a diffusion method of etching reliant upon the temperature of the gases employed for etching. The invention as claimed is not dependent upon the temperature of the initial gases but rather the resultant temperature after the ionization of the halogen gas as recited in independent claim 1 and new dependent claim 17. Moreover, Kitagawa teaches away from the concept of a confiner as recited in amended independent claim 1. Accordingly, Applicants respectfully submit

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Kitagawa fails to teach or suggest a plasma source comprising a high energy electron beam confiner wherein a confined high energy electron beam ionizes halogen gas creating cold plasma, as claimed in amended independent claim 1.

Amended independent claim 14 recites a system for plasma etching comprising a chamber, substrate material, masking material, and an electron source, and an ion extractor operable to remove negative ions...*in response to the electron source being energized.*

Applicants respectfully submit that both Ohtake and Savas employ a pulsed source wherein the etching is achieved during the off or cooling portion of the pulsed cycle of the electron source. This is in direct contrast of amended independent claim 14 wherein the etching is achieved in *response to the electron source being energized.*

The Examiner asserts that claim 14 is rejected under 35 U.S.C. § 102 (b), or in the alternative under 35 U.S.C. § 103 (a) as obvious over Ohtake. However, during the telephone interview the Examiner agreed to reconsider and withdraw the basis for this rejection.

Claims 1-8, 14 and 15 stand rejected under 35 U.S.C. § 103 (a) as being unpatentable over Walton I in view of U.S. Patent No. 5, 874, 807 to Neger and U.S. Patent No. 5, 413, 663 to Shimizu.

As discussed in the interview, the Walton I (written by the Applicants of this patent application) reference discloses the *results* of investigation used pulsed, electron beam produced plasma. Specifically, the authors state, “this proof-of-principle investigation...report[s] the experimental results using modulated electron-beam-generated plasmas...” Moreover, the results disclosed by Walton I employed a hollow cathode type source, which can’t be maintained in an energized state for a continuous time period as the present invention of amended independent claim 1 and 14. Accordingly, Walton fails to teach or suggest the present invention as claimed in amended claims 1 and 14.

The Neger patent teaches using a magnetically confined, sheet electron beam to ionize a background gas thereby producing a planar electron/ion plasma. This is in direct contrast to amended independent claims 1 and 14 which use an *ion-ion* plasma source. Accordingly, the

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Neger patent fails to teach or suggest the present invention as claimed in amended independent claim 1.

The Shimizu patent teaches a plasma processing apparatus that does not *remove* the negative ions from the plasma, as claimed in amended independent claim 14. Rather, in Shimizu the positive and negative ions are drawn out of the plasma, via a high frequency voltage. These ions are accelerated and collide with the wafer thereby causing etching. This is in contrast to the present invention, which recites in amended independent claim 14, *an ion extractor operable to remove negative ions from the plasma*.

New claim 16 has been added to more clearly capture the invention. Again, no new matter has been introduced.

In view of the foregoing, Applicants respectfully request the Examiner to find the application to be in condition for allowance with regards to claims 1-8, 14-16. However, if for any reason the Examiner feels that the application is not now in condition for allowance, he is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Applicants hereby petition for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 50-0281. In the event that there is a credit due, please credit Deposit Account No. 50-0281.

9/15/05
Date

Respectfully submitted,


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